

# KamLAND - Kamioka Liquid Scintillator Anti-Neutrino Detector

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KamLAND [1,2] is the world's longest baseline reactor neutrino experiment, presently under construction in the Kamioka mine under Mt. Ikenoyama near Mozumi, Japan. The primary goal of KamLAND is to search for neutrino oscillations using nuclear power reactors in Japan and eastern Asia as the source of neutrinos. Most of the neutrinos come from reactors located between 140 and 200 km from the mine site. An observed depletion in neutrino flux and/or a spectral distortion could verify that the Large-Mixing-Angle Solution (LMA) is the correct interpretation of the Solar Neutrino Problem. The LMA is an exciting possibility in light of the evidence for a maximal-mixing-angle explanation for the now well-established atmospheric neutrino anomaly. Large angles for all neutrino mixings could open up a new arena for understanding the origins of CP violation. If the LMA turns out not to be the correct explanation an upgraded KamLAND will be capable of investigating the Small-Mixing-Angle solution by observing the flux of solar neutrinos coming from the electron-capture decay of  $^7\text{Be}$  in the Sun. KamLAND detects reactor-produced anti-neutrinos with inverse beta decay on the proton. The traditionally robust signal of a prompt positron followed by delayed neutron capture allows background rejection compatible with the roughly two event a day expected signal. KamLAND is now well along on the construction phase. About 2000 20-inch diameter photomultiplier tubes (PMTs) are installed and tested in the 18-meter diameter stainless steel KamLAND containment sphere. A large 13-meter diameter balloon, which will contain the 1000 tons of liquid scintillator at the core of KamLAND, has already been delivered to the mine.

The experiment is funded in Japan and in the US after a 1999 proposal was accepted as a joint action between the US Department of Energy High Energy Physics and Nuclear Physics. LBNL along with UC Berkeley are the lead US institutions involved in the construction project. LBNL will provide the front-end electronics, the calibration deployment devices and project coordination support for the US collaborators.

## Footnotes and References

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1. <http://www.awa.tohoku.ac.jp/html/KamLAND/>

2. J. Busenitz, *et al.*, "Proposal for US participation in KamLAND", March 1999, unpublished.



Fig. 1. Photograph looking up from the bottom showing some of the installed PMTs within the KamLAND. The PMTs are deployed on the 18-meter diameter containment sphere of the detector. The PMTs were installed by teams of US and Japanese collaborators during summer and fall 2000.